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Remarks

Claims 1-24 were originally filed and are pending. Claims 16, 17, 19, 21, and 23 are allowed. Claims 11 and 12 are objected to as being dependent upon a rejected base claim, but are said to be allowable if rewritten in independent form. Claims 1, 8, 14-16, and 24 are being herein amended by deleting the term "polymer-bound" and replacing it with the definition of the term that is set forth at page 4, lines 15-16, of Applicants' specification.

Rejection Under 35 U.S.C. Section 112

Claims 1 and 9 were rejected under the second paragraph of Section 112 as being indefinite. The rejection is respectfully traversed for the following reasons.

The Examiner has stated that it is not clear that the term "polymer-bound" (in reference to a base) can cover a base that is bonded to an inorganic particle. Applicants previously referred the Examiner to the definition of "polymer-bound" set forth at page 4, lines 15-16, of Applicants' specification, which states that the term "polymer-bound means covalently bonded to a solid, organic polymer or inorganic particle that is substantially insoluble in the cationically curable composition." In view of this definition (and since the inorganic network of an inorganic particle can be viewed as being at least somewhat analogous to a polymer), Applicants believed that the claim language was quite clear as filed. In order to advance prosecution, however, Applicants have amended their claims to expressly recite the definition of this term.

The Examiner has further questioned the meaning of the term "base." Applicants are using this term in accordance with its usual meaning in the art, as explained in detail at, for example, page 12 of Applicants' specification. Applicants therefore respectfully submit that their claims are indeed clear and respectfully request that the rejection under Section 112 be withdrawn.

Rejection Under 35 U.S.C. Section 103

Claims 1-10, 13-15, 18, 20, 22, and 24 were rejected under Section 103(a) as being unpatentable over EP 1 348 742 A2 or Spera et al. (U.S. Patent Application Publication No. US 2003/0194560 A1, the U.S. counterpart of EP 1 348 742 A2; hereinafter, collectively addressed by reference to Spera et al.) in view of Lamon et al. (U.S. Patent No. 6,565,969). This rejection is respectfully traversed for the following reasons.

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Applicants claim a composition comprising:

- (a) at least one cationically curable species;
- (b) at least one cationic photoinitiator; and
- (c) at least one encapsulated base that is covalently bonded to a solid, organic

polymer or inorganic particle that is substantially insoluble in said composition.

(See amended Claim 1.) As mentioned above, the base of component (c) of the composition is covalently bonded to a solid, organic polymer or inorganic particle.

In contrast, Spera et al. describe coating powders comprising a solid, particulate film-forming composition and encapsulated catalysts. The film-forming composition can be a low-temperature cure coating powder such as an epoxy thermosetting resin and an optional catalyst. Catalysts useful to accelerate the cure of the epoxy resin are said to include, for example, imidazoles, tetrasubstituted organoborate salts, polyamines, and phenolics. (See, for example, paragraphs [0022] through [0030].)

Spera et al. state (at paragraph [0037]) that “[i]t has been found by the inventors hereof that use of a catalyst coated with or encapsulated in a polymeric material immiscible with the catalyst physically isolates the catalyst from the film forming polymer components.” Useful encapsulants are said to include wax and thermoplastic polymer (both of which can be melted in the presence of the catalyst and then cooled to effect solidification), as well as the reaction product of a microgel that contains carboxylic acid functional groups with a nitrogen-containing catalyst (see paragraphs [0038] through [0043]).

Applicants previously explained (in remarks that are incorporated herein by reference) that the encapsulated catalysts described by Spera et al. either have no chemical bonding between the catalyst and the encapsulant (when wax or a thermoplastic polymer is used) or have ionic bonding between a nitrogen-containing catalyst and a microgel that contains carboxylic acid functional groups. Thus, Spera et al. fail to teach or suggest the use of Applicants’ component (c), a base that is covalently bonded to a solid, organic polymer or inorganic particle that is substantially insoluble in the cationically curable composition.

The Examiner has asserted that, although Spera et al. do not mention a cationic photoinitiator, the onium salt compounds described by Spera et al. for use as thermal catalysts are known to function also as photoinitiators. Applicants disagree with this assertion, as the onium compounds that are described by Spera et al. are those comprising phosphorus, arsenic, and

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nitrogen (see, for example, paragraphs [0020] and [0021]). Onium salts comprising sulfur or iodine, however, are those that function as photoinitiators. Thus, Spera et al. also fail to teach or suggest Applicants' component (b), a cationic photoinitiator.

Lamon et al. describe an adhesive article comprising a bondable layer and a pressure sensitive adhesive layer on at least one major surface of the bondable layer, as well as an assembly comprising one or more substrates and the adhesive article. The bondable layer can comprise an epoxide, and a lengthy list of useful curatives is set forth at columns 13 and 14. The list includes encapsulated aliphatic amines and polymer bound amines or imidazoles. Lamon et al. further state (at column 13, lines 16-17) that "[i]t is also possible to use two or more curatives in combination."

The Examiner has asserted that it would have been obvious to select a combination of nitrogen-containing curatives such as encapsulated amines or polymer-bound amines or imidazoles and photochemically activated curatives (cationic photocatalysts), as Lamon et al. teach that the disclosed curatives can be used in combination. Applicants previously explained (in remarks that are incorporated herein by reference), however, that these two classes of materials function as curatives in two different types of curing mechanisms (anionic and cationic, respectively). Thus, one skilled in the art would not pair these two classes of curatives.

The Examiner has further asserted that it would have been obvious to employ such a combination of curatives in the composition of Spera et al. "motivated by a reasonable expectation of providing a composition curable by thermal and radiation means." Applicants are not aware that such "dual cure" has been viewed as desirable in the art. Spera et al. does not appear to teach or suggest such desirability (or even such a combination, as the onium salts described by Spera et al. are not photocatalysts, as explained above).

Furthermore, even if one assumes for purpose of argument that dual cure compositions are desirable, one skilled in the art would not have chosen this particular combination of curatives when presented with the teachings of Spera et al. and Lamon et al. Not only do the nitrogen-containing curatives and the cationic photocatalysts cure by different mechanisms, but it is known that the former class can inhibit the effectiveness of the latter.

As explained in Applicants' specification (for example, at page 1, line 23, through page 2, line 5), "[a]lthough onium salts are typically the initiators of choice for photocationic addition polymerization reactions, they can contain toxic elements and exhibit poor solubility in many

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organic solvents. The onium salts and their byproducts also tend to persist after polymerization, thereby imparting a strong acidic character to the resulting polymerized material.

Furthermore, with highly fluorinated anions, free hydrofluoric acid can be formed in the polymerized material through thermal degradation or hydrolysis of the anion. This can lead to thermal instability of the polymerized material or corrosion of substrates on which the polymerized material is placed.

One solution to this problem has been to add a base to the starting polymerizable composition as a neutralizing agent for the acid. However, bases can reduce the rate of polymerization and can leave unwanted byproducts of the neutralization reaction in the polymerized material" (emphasis added).

Lamon et al. actually describe at least three types or classes of thermal curatives: (1) polybasic acids and their anhydrides; (2) nitrogen-containing curatives; and (3) chloro-, bromo-, and fluoro-containing Lewis acids of aluminum, boron, antimony, and titanium (see, for example, column 13, lines 30-35). The first and third classes enable thermal cure without the above-referenced risk of inhibition of photocure that is associated with the bases of the second class. Thus, to one skilled in the art, the first and third classes would be the choices having a perhaps reasonable possibility of success. In addition, since the third class initiates cure via a cationic mechanism, one skilled in the art would have been most likely to select this class for combination with cationic photocatalysts if a "dual cure" composition were desired.

For the foregoing reasons, one skilled in the art would not have selected nitrogen-containing curatives from the thermal curatives described by Lamon et al. for use in the composition of Spera et al. This class of curatives simply did not provide a reasonable expectation of success, and better choices were described.

Applicants have discovered that certain materials (namely, encapsulated bases that are covalently bonded to a solid, organic polymer or inorganic particle as described above) can surprisingly improve the thermal stability of cationically cured compositions without significantly affecting the rate of photocure. The materials can be designed so that, under the curing conditions utilized (for example, at the curing temperature during photocure of the composition), their bases are chemically isolated from the other components of the composition. Under other conditions (for example, at elevated temperatures), the bases can be activated and

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available to neutralize any acidic species that are produced during the curing reaction (see the final step of the process of Claim 24).

Thus, the encapsulated bases of Applicants' composition serve to react with acidic species rather than to initiate cure. Preferred embodiments of the composition exhibit reduced static corrosion when in contact with metallic or metal oxide surfaces—especially conductive surfaces useful in the electronics industry (for example, copper, aluminum, and indium-tin-oxide). In view of these unexpected properties, and for the reasons detailed above, Applicants respectfully submit that their invention is indeed patentable over the applied combination of references and respectfully request that the rejection under Section 103 be withdrawn.

Concluding Remarks

Reconsideration and allowance of Applicants' claims are respectfully requested. Applicants thank the Examiner for the returned copies of Information Disclosure Statements that have been signed by the Examiner. Some of the references on these Statements have not been initialed, however, and Applicants respectfully request confirmation that all references have indeed been considered.

Respectfully submitted,

February 20, 2006
Date

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